REVISED SAMPLING AND ANALYSIS PLAN
SUPPLEMENTAL SAMPLING FOR
COMPREHENSIVE SITE INVESTIGATION
FOR
AREA NO. 13 OF THE
WEST PULLMAN INDUSTRIAL REDEVELOPMENT AREA
DUTCH BOY / NATIONAL LEAD SITE
12000 TO 12054 SOUTH PEORIA STREET AND
901 TO 935 WEST 120TH STREET
CHICAGO, ILLINOIS

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January 24, 2007

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1.0 INTRODUCTION

This sampling and anlysis plan (SAP) describes the activities proposed for collecting supplemental data as part of a comprehensive site investigation (CSI) of the Dutch Boy site in accordance with Illinois Administrative Code (IAC) Title 35, Part 740, Site Remediation Program (SRP). This SAP has been prepared by Tetra Tech EM Inc. (Tetra Tech) at the request of the City of Chicago, Department of Environment (CDOE). The objective of the CSI is to define the horizontal and vertical limits of impacts previously identified during prior site investigations on subsurface soils.

Section 2.0 of this SAP presents site background information. Section 3.0 summarizes the physical setting of the site. Section 4.0 discusses field mobilization. Section 5.0 describes the field investigation proposed for the CSI. Section 6.0 presents the data analysis and evaluation process for the CSI. Section 7.0 is the quality assurance project plan (QAPP). Section 8.0 presents the proposed project schedule.

2.0 SITE BACKGROUND

This section (1) presents a site description, (2) summarizes the site history, (3) identifies the current site use, (4) summarizes previous site investigations, (5) discusses the site remedial action, and (6) identifies potential contaminants of concern at the site.

2.1 SITE DESCRIPTION

The site is located from 12000 to 12054 South Peoria Street and from 901 to 935 West 120th Street in Cook County, Illinois (Figure 1). The site covers 5.2 acres in a former industrial area. The site is bounded on the north by West 120th Street, on the east by South Peoria Street, on the south by Illinois Central Gulf Railroad tracks, and on the west by a former industrial property. No standing buildings remain at the site, although concrete slab foundations or former basement slabs cover portions of the site.

2.2 SITE HISTORY

The history of the site property was researched through review of (1) Sanborn Fire Insurance (Sanborn) Maps dated 1939, 1950, 1975, 1987, and 1993 and (2) previous investigation reports.

The 1939 Sanborn Map shows the company name as National Lead, Carter Branch. Both oil houses are shown. There were two oil houses, an oil refinery, a reservoir, and an underground cistern. Railroad spurs crossed the property.

The 1950 Sanborn Map depicts seven linseed oil tanks at the west boundary of the area. The 1975 Sanborn Map shows several aboveground storage tanks adjacent and to the west of the oil house. The 1987 Sanborn Map shows the site property as being vacant. The 1993 Sanborn Map shows the property as being vacant except for concrete ruins along Peoria Avenue.

Copies of the Sanborn Maps are included in Attachment A.

2.3 CURRENT SITE USE

The site is currently vacant.

2.4 PREVIOUS SITE INVESTIGATIONS AND REMOVAL ACTIONS

This section summarizes previous site investigations conducted by the following parties: the Illinois Environmental Protection Agency (IEPA); Toxcon Engineering Company, Inc. (Toxcon); Ecology & Environment, Inc. (E&E); Simon Hydro-Search, Inc. (Simon); Harza Environmental Services, Inc. (Harza); the U.S. Environmental Protection Agency (U.S. EPA); Science Applications International Corporation (SAIC); ENVIRON Corporation (Environ); Earth Tech; Environmental Strategies Consulting LLC (ESC); and Tetra Tech EM Inc (Tetra Tech).

2.4.1 IEPA Removal Action

An IEPA removal action was conducted at the site in three phases between June 1986 and 1987.

During a Phase I assessment in June 1986, IEPA removed and disposed of surficial solids either suspected or known to contain lead and asbestos.

During a Phase II assessment in November 1986, IEPA sampled, analyzed, and disposed of the liquids, solids, and sludges contained in all the site's aboveground storage tanks (AST) and underground storage tanks (UST). IEPA also removed all existing process and production equipment, baghouses, mixing tanks, screw conveyors, hoppers, masonry rubble, asbestos, and debris. Additionally, IEPA demolished all free-standing building walls.

During a Phase III assessment in 1987, IEPA assessed the structural integrity of the site USTs and concluded that they were structurally sound and did not leak. Soil samples were collected and analyzed for lead. Results indicated that 130 cubic yards (yd^3) of soil on and adjacent to the site contained extraction procedure (EP) toxicity extract lead concentrations greater than 5 milligrams per liter (mg/L) and that 140 yd^3 of soil contained more than 1 percent lead.

2.4.2 Toxcon Field Investigation

In June 1987, Toxcon collected 34 samples from locations on site and in the parkway across the street from the site on behalf of National Lead. Samples collected from the northeast and west portions of the site contained total lead concentrations of 11,400 and 50,000 milligrams per kilogram (mg/kg), respectively. The sample from the west portion of the site had an EP toxicity extract lead concentration of 41 mg/L. Additional field sampling was conducted in June 1988, and Toxcon concluded that one on-site area and two off-site areas contained EP toxicity extract lead concentrations greater than 5 mg/L.

2.4.3 E&E Site Reconnaissance

In 1991, E&E conducted an investigation of the site on behalf of U.S. EPA. E&E observed small piles of household and construction refuse scattered over the site. Because potentially hazardous substances and lead-containing soil were still present, E&E concluded that the potential release of hazardous substances to the air posed a threat to human health. E&E recommended that the site be secured to prevent access by the public and that further investigation of the site take place to determine whether the site posed a potential threat to the community. On August 10, 1993, U.S. EPA, IEPA, and E&E conducted a site assessment. No soil piles or exposed soils were identified, and no soil samples were collected.

2.4.4 Simon Environmental Assessment

On August 25 and 26, 1993, Simon collected 11 soil samples from seven on-site locations. Samples collected on the west side of the site along the loading dock and railroad spur contained total lead concentrations as high as 45,700 mg/kg and toxicity characteristic leaching procedure (TCLP) lead extract concentrations as high as 694 mg/L. Samples collected in the road outside the northeast corner of the site contained total lead concentrations as high as 19,200 mg/kg and a maximum TCLP lead extract concentration of 98.4 mg/L.

2.4.5 Harza Site Investigation

On May 10, 1994, Harza conducted a site investigation on behalf of the City of Chicago. Harza collected 13 wipe samples and 13 scrape samples from the former mill building on site. Seven of the wipe and eight of the scrape samples met the Illinois Department of Public Health (IDPH) definition of a lead-bearing substance. Six soil samples collected from depths of 6 and 15 feet below ground surface (bgs) were analyzed for TCLP lead. One additional soil sample was collected at a depth of 1.0 to 2.5 feet bgs. All the samples had TCLP lead extract concentrations at or below the 5.0 mg/l Resource, Conservation, and Recovery Act (RCRA) concentration that defines a hazardous waste.

2.4.6 U.S. EPA Site Assessment

On June 8, 1995, U.S. EPA, E&E, and Harza conducted an additional site assessment. Six soil samples were collected and analyzed for lead. Total lead was detected in on-site soil at concentrations ranging from 1,540 to 31,700 mg/kg. A sample collected along the northernmost loading dock had a TCLP lead extract concentration of 351 mg/L.

2.4.7 SAIC Site History Review

In February 1996, SAIC reviewed the available reports on the site and assessed the potential for a release of lead from the site. SAIC calculated that approximately 166 tons of lead had been released into the air between 1906 and 1980 from historical site manufacturing processes.

2.4.8 U.S. EPA Interim Final Risk Assessment

In March 1996, U.S. EPA prepared an interim final risk assessment for the site. U.S. EPA assumed that the site would be used for occupational purposes and that it would not be frequented by small children. Based on these assumptions, U.S. EPA calculated a risk-based cleanup goal of 1,400 mg/kg as the average concentration of lead in site soil. U.S. EPA concluded that any site locations with total lead concentrations higher than 1,400 mg/kg should be remediated.

2.4.9 Environ Extent of Contamination Survey

In 1997, an extent of contamination (EOC) survey was conducted at the site by Environ. The objective of the survey was to evaluate the vertical and horizontal extent of lead contamination in soil at the site and in its vicinity. Over 350 soil samples were collected from 151 locations and analyzed for lead. The on-site soil containing lead at concentrations greater than the 1,400-mg/kg average risk-based cleanup goal was found to be generally limited to the unpaved west portions of the site, including the railroad spurs leading to the loading dock. Lead concentrations in surface soil in the railroad spur area ranged from 5,000 to 10,000 mg/kg. Selected soil samples were analyzed for other chemicals to evaluate their potential impact on remedial technologies. Diesel-related petroleum hydrocarbons were identified in soil samples collected near the loading dock in the northwest corner of the site. The petroleum hydrocarbon-impacted soil was found to be confined to the immediate vicinity of the UST.

2.4.10 Environ Risk Management Plan Preparation

In 1998, National Lead Industries retained Environ to prepare a risk management plan for mitigation of risks to human health and the environment at the site. The four remedial alternatives developed to mitigate risks posed by the lead contamination included (1) on-site containment, (2) excavation of "principal threat waste" (defined by U.S. EPA as having a lead concentration of 40,000 mg/kg), (3) excavation of 2 to 4 feet of contaminated soil, and (4) excavation of all contaminated soil. The remedial action recommended by Environ was to excavate the top 2 to 4 feet of soil in the "principal threat" area, treat and dispose of the soil off site, and backfill and place 5 feet of soil cover over unpaved areas.

2.4.11 Tetra Tech Preliminary Site Investigation

Tetra Tech completed a preliminary site investigation on July 13, 1999. This investigation was completed to determine whether additional soil should be remediated by National Lead during the ongoing remedial action. The preliminary site investigation included advancement of four continuous soil borings in the area remediated by Environmental Strategies Corporation (ESC). Soil samples collected during the investigation were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), total priority pollutant (TPP) metals, and pH.

2.4.12 ESC Removal Action

In accordance with a March 26, 1996, unilateral administrative order (UAO) issued by U.S. EPA, National Lead implemented a remedial action to abate risks associated with lead-contaminated soil at the site. ESC performed the remedial action which includes excavation, treatment, and disposal of all soil in unpaved areas of the site and soil in the parkways containing total lead concentrations greater than U.S. EPA's risk-based cleanup goal of 1,400 mg/kg. The action also includes removal of all site USTs and ASTs. The remedial actions were performed between May 6, 1999 to October 21, 1999.

A total of 7,848 tons of lead contaminated soil was excavated and stockpiled from the onsite unpaved areas at the site. Of the total tons of lead contaminated soil, 7,236 tons were treated by stabilization and transported for disposal. Samples were collected of the treated pile and analyzed for TCLP lead. All 14 samples from the treated soil pile did not exceed the RCRA regulatory level of 5.0 mg/l. Samples collected of the untreated soil piles did not contain TCLP lead in excess of 5.0 mg/l, therefore, the 612 tons of untreated soil was disposed of as nonhazardous waste. A total of 51 confirmation soil samples were collected from the remediated areas and analyzed for total lead. All final confirmation soil samples did not exceed the cleanup criteria of 1,400 milligrams per kilogram (mg/kg) of total lead. Depths of excavation ranged from 2 to 4 feet in the unpaved area.

Nine underground storage tanks (UST) were removed and disposed of off site. Soil was excavated from the UST removal to a depth of 9 feet bgs. A total of 234 cubic yards of concrete was removed and disposed of from the UST area. A total of 17 confirmation soil samples were collected from the UST excavation and analyzed for total lead. All UST excavation confirmation soil samples contained total lead concentrations below the cleanup criteria of 1,400 mg/kg with the exception of one sample (UST-017) which contained a total lead concentration of 1,700 mg/kg, collected from a depth of 9 feet bgs.

A total of 8,180 cubic yards of backfill was placed and compacted at the site. About 0.6 acres were seeded and mulched. A total of 40 cubic yards of debris that potentially contained lead impacted soil were treated.

2.4.13 Tetra Tech Extent of Contamination Study

In October 2000, Tetra Tech conducted an extent of contamination (EOC) study in the northeast corner of the site. Tetra Tech conducted sampling in a 100 by 60 foot grid area. A total of 24 samples were collected from 8 sample locations. Samples were collected from 0-2 feet, 2-3 feet, and 3-4 feet bgs. Samples were analyzed for total lead, and if the total lead concentration was greater than 400 mg/kg, then the samples were run for TCLP lead. Of the 24 samples analyzed, five samples were greater than 400 mg/kg. Of those five samples, three samples had TCLP results exceeding 5 mg/l. As a result of these findings, approximately 800 tons of soil was stabilized in situ and then removed and disposed of off site as special waste at Waste Management CID Landfill, Calumet City, Illinois.

2.4.14 Earth Tech Phase III Removal Action

Earth Tech conducted a Phase III removal action at the site from July 11, 2000 until February 13, 2001. The removal action entailed three major tasks: 1) surface debris removal, 2) asbestos and water removal in the basements, and 3) concrete removal, excavation and disposal of lead-contaminated soil, and backfilling. Under task 1, Earth Tech removed two surficial debris piles, 1,119 tons of concrete, 52 tons of railroad ties, and 41 tons of miscellaneous wastes consisting of construction debris and car tires. Task 2 was broken down into five subtasks: 1) dewatering, 2) asbestos survey, 3) asbestos abatement, 4) AST removal, and 5) sludge removal and disposal. Earth Tech pumped out 300,800 gallons of water from the tank basement, north corridor basement and west basement for offsite treatment and disposal. An asbestos survey was conducted on July 18, 2000 and revealed the presence of asbestos-containing material (ACM) on piping in the central and west pipe tunnels. A total of 579 linear feet of pipe insulation and 2.9 tons of surficial wastes containing ACM were removed and disposed. Six tanks were removed from the tank and west basements. The four tanks located in the tank basement contained water and residual resins which were hazardous based upon flashpoint. A total of 22,500 gallons of non-hazardous wastewater was removed for offsite disposal. The resin was transferred from the tanks into 32 55-gallon drums. These drums were transported offsite and disposed of as a hazardous waste. A total of 830 tons of sludge from the sludge basement was solidified and sent offsite for treatment and disposal. Under task 3, Earth Tech *demolished the concrete foundation above each of the basement areas. Concrete flooring, interior* basement walls, and foundation supports were demolished to two feet below grade. A total of 1,345 tons of concrete was hauled offsite. Additional concrete was used to fill the sludge basement and west basement areas. Concrete slabs, at grade and containing no voids beneath, were broken to allow for draining and left in place. Foundry sand, discovered beneath the north and southwest slabs, was used to solidify the sludge. Excess foundry sand, 383 tons, and 82 tons of lead contaminated soil, mixed with broken concrete, bricks and metal was transported off-site for treatment and disposal.

2.4.15 Tetra Tech Comprehensive Site Investigation

In May 2001, Tetra Tech conducted a CSI investigation on behalf of the CDOE. During the CSI, constituents of environmental concern were identified in subsurface soil at the site. The concentrations of these constituents were compared to TACO Tier 1 industrial-commercial property remediation objectives for the industrial-commercial and construction worker exposure scenarios. Specifically, PCBs, SVOCs, TPP metals and GRO/DRO were detected at the site at concentrations exceeding TACO Tier 1 remediation objectives or applicable regional background concentrations.

2.4.16 Tetra Tech Site Assessment

In September 2001, Tetra Tech performed a site assessment on behalf of U.S. EPA. Tetra Tech collected 27 soil samples between 0 and 3 feet bgs for total lead and TCLP lead. Ten samples exceeded the U.S. EPA soil screening level for total lead of 750 mg/kg and seven samples exceeded the regulatory limit of 5.0 milligrams per liter as outlined in 40 CFR Section 261.24(b) Table 1.

2.4.17 ESC Site Reassessment

In June 2003, ESC performed a site reassessment on behalf of National Lead. ESC advanced six soil borings (ESC-01 through ESC-06) to total depths of 6 feet and soil samples were analyzed by XRF and were submitted for laboratory analysis for total lead. Total lead concentrations ranged from 7.5 to 66,000 mg/kg.

2.4.18 Tetra Tech Removal Action

From February to May 2004, Tetra Tech removed large concrete debris from the basement areas and disposed of it off site. The concrete was generated by Earth Tech during the removal actions described in Section 2.4.13, and had been placed in basement areas at the site. Tetra Tech removed the smaller-sized concrete and debris was from the basement areas and stockpiled them on the sides of the basement areas to allow ESC access for sampling.

2.4.19 ESC Supplemental Soil Sampling

In June and July 2005, ESC returned to the site and performed supplemental soil sampling on behalf of National Lead. A total of 33 soil borings were advanced to a maximum depth of 4 feet and 56 soil samples were submitted for laboratory analysis of total lead. Analytical results indicated that total lead concentrations ranged from 13 to 34,000 mg/kg. Tetra Tech performed oversight of the ESC supplemental soil sampling event and collected split samples with ESC. Tetra Tech submitted 66 soil samples for laboratory analysis of total lead and TCLP lead. Tetra Tech's analytical results ranged from 8.7 to 52,000 mg/kg total lead and from non-detect to 450 mg/L for TCLP lead. Figure 2 in Attachment B summarizes ESC soil boring locations and analytical results.

2.4.20 Tetra Tech Soil Sampling

In August 2005, Tetra Tech advanced 16 soil borings to depths of four feet on the north and west sides of the main basement area and submitted the soil samples for total lead. The laboratory analytical results ranged from 21 to 10,000 mg/kg as total lead.

2.5 CONTAMINANTS OF CONCERN

After reviewing historical information and environmental studies concerning the site, Tetra Tech has identified total and TCLP lead, PCBs, and SVOCs as the remaining contaminants of concern still present at the site. Table 1 summarizes soil sample analytical data collected at the site for total lead and TCLP lead since July 1999. Table 2 summarizes the soil sample analytical data collected during Tetra Tech's CSI activities (Sections 2.4.11 and 2.4.15). Figure 2 shows all former soil boring locations. Figure 3 shows soil borings with analytical results exceeding the 1,400 mg/kg site-specific remediation objective for total lead. Figure 4 shows soil borings with analytical results exceeding the 5.0 mg/L remediation objective for TCLP lead.

3.0 PHYSICAL SETTING

This section describes the topographic, geologic, and hydrogeologic settings of the site. Information presented in this section has been drawn from previous site reports and from the U.S. Geological Survey (USGS) 7.5-minute series Blue Island quadrangle map.

3.1 TOPOGRAPHIC SETTING

The USGS map shows the elevation of the site as being approximately 610 feet above mean sea level. The contours on the map indicate that the site is generally flat and that the area's topography slopes gently downward to the south toward the Little Calumet River, which is more than 1 mile from the site. The site is not located within a 100-year or 500-year flood plain.

3.2 GEOLOGIC SETTING

The surface features of the Chicago area are largely the result of glaciation. The glacial deposits almost completely mask a bedrock surface on which glacial and stream erosion produced a relief and roughness comparable to that of the present surface. The site area lies in the Chicago Lake Plain section, which primarily includes different floors of glacial lakes flattened by wave erosion and by minor deposition in low areas. Glacial till and thin deposits of silt, clay, and sand of the Equality Formation largely underlie the region.

Soil samples collected during the preliminary site investigation indicate that the lithology at the site includes fine, silty sand mixed with debris present from 0 to 5 feet below ground surface (bgs), sandy silt present 5 to 8 feet bgs underlain by gray silty clay. However, currently much of the site has been disturbed and an engineered barrier of compacted soil is in place in portions of the site.

A perched water zone was encountered from 6 to 8 feet bgs in the soil borings completed during the preliminary site investigation.

3.3 HYDROGEOLOGIC SETTING

Three aquifer systems are typically present in the site: the unconsolidated deposits, the Silurian dolomite, and the deep Ordovician-Cambrian sandstone. Groundwater can be found in the sand and gravel portions of the glacial drift.

Potable water for the site area is provided by the City of Chicago municipal water system, which draws its water from Lake Michigan. No potable groundwater aquifers exist in Chicago, and no potable water supply wells are expected to be installed. Furthermore, a memorandum of understanding issued by the city prohibits use of existing groundwater wells to obtain potable water and prohibits installation of new potable water supply wells.

A perched water zone was encountered from 6 to 8 feet bgs in the soil borings completed during the preliminary site investigation. The perched zone is present because porous soil (sandy silt) overlies an impervious layer (silty clay).

4.0 FIELD MOBILIZATION

Upon approval of this SAP, Tetra Tech's initial task will be to mobilize field investigation staff and equipment to the site. The lack of an available building on site will require that Tetra Tech maintain mobile or cellular telephone facilities in Tetra Tech and subcontractor vehicles. Field mobilization is expected to be completed during the first day of field investigation activities. A site-specific health and safety plan (HASP) will be generated prior to these activities.

The field mobilization effort will include the following elements, which are discussed below.

- Establish a decontamination area
- Establish an on-site waste accumulation area
- Identify sampling locations

- Evaluate emergency procedures
- Conduct an on-site safety briefing

4.1 ESTABLISH A DECONTAMINATION AREA

An equipment decontamination area will be established at the site for decontamination of large equipment such as augers and drill rods. A temporary equipment decontamination area will be established on a daily basis near the work area to support direct-push and hand sampling for the day. To prevent cross-contamination of boreholes, drilling equipment will be decontaminated between borehole locations. Wastewater generated from equipment and personnel decontamination activities will be stored in 55-gallon drums for future transport to an off-site storage area.

4.2 ESTABLISH AN ON-SITE WASTE ACCUMULATION AREA

An on-site waste accumulation area will be established for temporary storage of drummed soil and wastewater (see Section 4.1). Wastes will be stored in 55-gallon drums in the accumulation area. Upon the completion of the field investigation, the accumulated wastes will be sampled and analyzed to characterize them for disposal purposes.

4.3 IDENTIFY SAMPLING LOCATIONS

Proposed soil boring locations will be identified using GPS and marked. Final selection of boring locations will depend on their accessibility and proximity to overhead and underground utilities. Tetra Tech will contact Illinois' "DIGGER" and will not commence boring and sampling activities until all utilities are cleared. Work areas will be clearly marked to establish a work area control perimeter.

4.4 EVALUATE EMERGENCY PROCEDURES

Emergency procedures, especially routes of site egress, will be evaluated when all field investigation personnel arrive on site. This will be done to ensure that routes of emergency egress from sampling locations are not inadvertently blocked. The hospital route identified in the HASP will be driven to verify that it is efficient. A field staff safety meeting will be held to ensure that all site personnel understand the hospital route. A hospital route map with clear directions will be kept in all site vehicles.

4.5 CONDUCT AN ON-SITE SAFETY BRIEFING

Prior to any direct-push sampling, the Tetra Tech site safety supervisor will conduct an on-site safety briefing. The briefing will be held to review potential hazards, explain the HASP, obtain the safety training records and medical histories of all personnel working at the site, and answer any questions on field investigation activities. The safety briefing will be described in greater detail in the HASP.

5.0 FIELD INVESTIGATION

The field investigation activities have been designed to meet the investigation requirements of IEPA and to collect the data needed to determine a remedial strategy for the site. The investigation activities will include subsurface soil sampling.

The objectives of the field investigation are to define:

1) the horizontal and vertical limits of previously identified total lead exceedances of 1,400 mg/kg.
2) the horizontal and vertical limits of previously identified TCLP lead exceedances of 5 mg/L.

3) the extent of PCB concentrations detected at soil boring SB-26
4) the extent of petroleum hydrocarbon impacts detected at soil boring SB-32
5) the extent of polynuclear aromatic hydrocarbon (PAH) impacts in vicinity of soil borings SB-15, SB-17, SB-27, and SB-32
6) the waste pile material present at the site
7) the total and TCLP lead concentrations of soil located beneath existing and former concrete pads

In addition during the field investigation, Tetra Tech will assess the presence or absence of concrete pads in each of the sampling locations.

Sections 5.1 and 5.2 respectively discuss soil boring and sampling locations and soil sampling procedures for the field investigation.

5.1 SOIL BORING AND SAMPLING LOCATIONS

Tetra Tech proposes to complete a total of 106 soil borings at the site to delineate the extent of total lead or TCLP lead exceedances. 47 soil boring locations will be selected based on previous sample results. An additional 58 soil boring sample locations will be determined using a 50-foot by 50-foot grid placed over the unremediated portions of the site. One soil boring from within each grid will be advanced. In addition, 5 of the soil borings will be advanced in areas that previous sampling has shown to exceed TACO Tier 1 industrial-commercial remediation objectives for PCBs, PAH, or total petroleum hydrocarbons. Five soil borings advanced along the western side of the site will also be laboratory analyzed for PCBs. The soil borings will be advanced in locations that will adequately delineate potential horizontal and vertical contamination. One composite soil sample will also be collected from the waste pile material present at the site for waste characterization purposes. Soil samples will be collected using the approach described in Section 5.2. Table 2 summarizes the sampling and analysis approach for the site. Figure 5 is a site map showing the proposed soil sampling locations.

5.2 SOIL SAMPLING PROCEDURES

Tetra Tech will advance soil borings using direct push-methods. The soil borings will be completed using a truck-mounted direct-push mechanism and decontaminated, 3- or 4-foot-long macro-samplers with dedicated polyvinyl chloride (PVC) liners. Each soil boring will be continuously advanced to a depth of 12 feet bgs. Soil borings located in concrete areas will be advanced after coring through the concrete. The soil samples will be retrieved from the macro-sampler and sliced longitudinally. The Tetra Tech geologist will log the soil borings noting soil type, colorations, odors, and moisture. Each soil sample will be field screened with a photoionization detector (PID).

A representative sample from each 2-foot interval of similar geologic material will be placed in a plastic bag and homogenized prior to sample collection. After thorough mixing, the composited soil samples will be placed into laboratory-provided 8-ounce jars for laboratory analysis. The soil samples will be placed on ice in a cooler and submitted to STAT Analysis laboratory in Chicago, Illinois. Because portions of the site have been capped, Tetra Tech will use care in logging the soil types and depths of changes in lithology. If feasible, Tetra Tech will keep imported capping materials jarred separately from in-place soils.

Three soil samples from three separate depth intervals will be submitted for laboratory analysis from each soil boring. The depth intervals to be analyzed initially are 0-2; 4-6; and 8-10 feet bgs. The soil samples from the remaining depth intervals will be archived at the laboratory pending future laboratory analysis. The soil samples will be laboratory analyzed for total lead and TCLP lead. Specific soil samples will also be laboratory analyzed for PCBs or PAHs, as described in Table 2. In the event that soil lithology indicates several separate soil types, samples will be collected from each soil type for laboratory analysis. In the event that elevated PID readings are experienced, samples from these depth intervals will be laboratory analyzed for VOCs and SVOCs. Upon completion of each soil boring sampling location, soil not retained for laboratory analysis will be returned to the borehole from the original interval it was collected.

The composite waste characterization sample will be collected from the waste piles using a stainless steel hand trowel. The sample will be homogenized and placed in a 1000 mL jar for laboratory analysis of waste characterization parameters.

5.3 SOIL BORING ELEVATION SURVEYING

At the completion of the soil boring investigation, Tetra Tech will survey the elevations of the ground surface at each soil boring location.

6.0 DATA ANALYSIS AND EVALUATION

This section summarizes Tetra Tech's plan to analyze and evaluate the data generated during the field investigation in order to meet the CSI requirements stated in the SRP.

6.1 CHARACTERIZATION OF SITE IMPACTS

Tetra Tech will review the field and laboratory data within the context of the site's history and its geological and hydrogeological settings to assess the degree and extent of residual contaminant impacts at the site. This assessment will include identification of contaminants, identification of physical and chemical properties affecting contaminant mobility, and delineation of impacted zones based on field observations and laboratory analysis of subsurface soil samples.

The entire project team will participate in the interpretation and evaluation of all information collected and data generated. This effort will include preparation of boring logs, figures, and tables that will be used to present the data and to characterize the extent of contamination.

6.2 EXPOSURE EVALUATION

Tetra Tech will also provide a qualitative estimate of potential human health and environmental impacts through identification of potential human and environmental receptors that may be affected by contaminants of concern because of the existence of a complete exposure route. Potential natural and manmade pathways of contaminant transport will be identified during the supplemental CSI. Any evidence of migration of contaminants of concern along such pathways that may indicate an exposure route for human or environmental receptors will be identified and investigated. Any human or environmental receptors that might be exposed and the pathways and routes which they might be exposed will be identified and investigated. Any site uses or features that may affect any contaminant migration pathway or exposure level for a receptor will be investigated.

7.0 QUALITY ASSURANCE PROJECT PLAN

This section discusses the project objectives, project organization and responsibilities, and quality assurance (QA) objectives, and level of quality control (QC) effort associated with the supplemental CSI for the site. Protocols for sampling, sample chain of custody (COC); data reduction, validation, and reporting; and internal QC checks are also identified.

All project QA/QC procedures will be conducted in accordance with applicable professional technical standards, IEPA requirements, government regulations and guidelines, and project goals and requirements. Tetra Tech has prepared this QAPP in accordance with applicable QAPP guidance and the model QAPP (U.S. EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" [QAMS-005080] and IEPA's Analytical Quality Assurance Plan, Revision 2" dated April 11, 1996).

7.1 PROJECT OBJECTIVES

The goal of the CSI is to generate accurate data that can be used for preliminary characterization of possible areas of environmental concern at the site. The functional activities proposed to accomplish the objectives of the CSI include the following:

- Mobilization of staff and equipment to the site
- Completion of soil borings and soil sampling to characterize subsurface soil on site
- Interpretation and evaluation of all data collected and preparation of a CSI report in accordance with the SRP

Sections 4.0, 5.0, and 6.0 of this SAP detail these activities.

7.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

Tetra Tech will apply the QA elements described in Section 7.0 in accordance with applicable U.S. EPA and IEPA guidance to ensure technical quality and consistency throughout the project. Specific personnel have been identified who will be responsible for implementing the QC aspects of the project. Key project positions include the project manager, field team leader, and technical support staff. The project manager will be responsible for all project activities and will ensure that all technical objectives are met in accordance with schedule and budget requirements. The Tetra Tech project manager will be the primary point of contact for the CDOE and will ensure that all project deliverables are of high technical quality.

Technical support staff will be responsible for field and laboratory activities, daily coordination and communication, and preparation of project documents. The drilling and laboratory subcontractors will be directed and monitored. All Tetra Tech field personnel have completed Occupational Safety and Health Act (OSHA)-required safety training, including supervisory training and annual updates, and participate in an annual medical monitoring program.

7.3 QA OBJECTIVES

The overall QA objective for the project is to develop and implement procedures for field sampling, sample COC, laboratory analysis, and reporting that will provide results that are valid and that meet the data quality objectives. Procedures for sampling, sample COC, laboratory instrument calibration, laboratory analysis, reporting of data, and internal QC are identified in other sections of this SAP. The purpose of this section is to present the project QA objectives for precision, accuracy, representativeness, completeness, and comparability.

Environmental measurements have inherent limitations arising from equipment problems, procedural deviations, and changes in ambient conditions. Most environmental measurements are analyses made for extremely low concentrations of constituents and are subject to chemical interferences, instrument limitations, and uncertainties that affect the accuracy of the determinations. It is essential to minimize these variable factors so that the measurements accurately reflect the character of the samples collected. All data generated during the course of the supplemental CSI by Tetra Tech or the laboratory will meet objectives for precision, accuracy, representativeness, completeness, and comparability. These characteristics are defined below.

Precision is the agreement among a set of replicate measurements without consideration of the "true" or accurate value. That is, is the variability between analyses of the same material for the same analyte. Precision is measured in a variety of ways, including statistically by calculating variance or standard deviation.

Accuracy is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error. Laboratories assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," or materials of accepted reference value. Accuracy can be measured and expressed in terms of the recovery of surrogate compounds (for organic analyses) or the recovery of spiked compounds (for inorganic analyses). This approach provides an indication of the expected recovery for analytes tending to behave chemically like the surrogate or spiked compounds.

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter that depends on the design of the sampling program and laboratory QC protocols.

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

Comparability expresses the confidence with which one data set can be compared to another.

Specific QA objectives for the analytical methods and measurement parameters identified in Section 5.0 of this SAP are outlined in U.S. EPA's "Test Methods for Evaluation Solid Waste" (SW-846). The proposed sampling approach and procedures are discussed in Section 5.0 of this SAP.

7.4 LEVEL OF QC EFFORT

Field duplicates and matrix spike (MS) samples will be analyzed to assess the quality of the data generated by the field sampling program. Field duplicates will be analyzed as a check of sampling and analytical reproducibility. MSs will provide information about the effect of the sample matrix on the digestion and measurement methodology. All MSs will be performed in duplicate. Tetra Tech will collect MS and matrix spike duplicate (MSD) samples for QC analysis. MS/MSD samples are typically collected at a frequency of one for each group of 20 or fewer investigative samples from each sample matrix. For each analytical parameter, Tetra Tech will collect one additional sample for MS analysis and a second additional sample for MSD analysis for every 20 investigative samples. Because MS/MSD samples will be collected as separate sample volumes in separate containers, both the MS and MSD samples will be equivalent to field duplicates. Thus, analytical results for the MS/MSD samples can be used to evaluate the precision of both sampling and analytical procedures.

Table 3 summarizes the proposed investigative and QC samples for this project.

7.5 SAMPLING PROCEDURES

Subsurface soil is the medium to be sampled during the supplemental CSI. The sampling locations and number of samples discussed in Section 5.0 of this SAP are based on the findings of previous site investigations. Sampling procedures are discussed in Section 5.2 of this work plan. Sampling locations will include areas suspected to be contaminated in order to delineate the extent of site impacts.

7.6 SAMPLE COC PROCEDURES

COC procedures will be used to document sample possession from the time of collection to the time of disposal in accordance with U.S. EPA guidance.

7.7 DATA REDUCTION, VALIDATION, AND REPORTING

The SRP requires that analytical data generated for the CSI be checked for precision, accuracy, and completeness. The SRP further requires that the remedial applicant or an authorized representative and the analytical laboratory provide analyses of samples meeting the SRP precision, accuracy, and completeness objectives. To facilitate IEPA review and acceptance of laboratory analytical data, the remedial applicant must report laboratory data to IEPA in a standard format using IEPA-defined criteria for data reduction, validation, and reporting.

All analytical data generated during the project will be checked for validity. The results of this process will determine whether particular data are reportable, particular data are outliers, or additional samples should be collected.

Upon receipt of laboratory analytical results, Tetra Tech will randomly select and validate the results for a minimum of 10 percent of the samples analyzed. Based on the results of the data validation, Tetra Tech will assess the need to validate the remaining data. The results of the data validation process will reveal whether the laboratory data set meets QAPP requirements. The data validation process involves review of laboratory procedures and performance reports for the samples analyzed to determine whether the analyses were performed in accordance with the requirements of the methods prescribed and the laboratory's internal QA/QC procedures. Tetra Tech's laboratory data validators will receive and review information regarding the following:

- Extraction holding times
- Analysis holding times
- Instrument performance checks
- Initial calibrations
- Continuing calibrations
- System monitoring compounds (surrogates)
- MS/MSDs
- Laboratory control samples
- Internal standards

7.8 INTERNAL LABORATORY QC CHECKS

Internal laboratory QC checks will be performed in accordance with the guidelines of the U.S. EPA Contract Laboratory Program. These guidelines and the procedures in SW-846 specify the number of calibration standards to be used, the frequency with which the calibration standards will be applied, the frequency with which laboratory duplicates will be analyzed, and the frequency with which spiked and reference samples will be analyzed.

8.0 PROJECT SCHEDULE

The anticipated duration of the CSI field investigation activities is 8 days. Analysis of all the samples collected during the CSI is projected to require 2 weeks. Tetra Tech assumes that initial data evaluation and report preparation activities will be conducted at the same time as data validation. Tetra Tech also assumes that completion of the data evaluation process and report preparation will require 4 weeks. The entire schedule for the project, from mobilization for field investigation activities to release of the draft final CSI report, is 8 weeks.

TABLES

(40 Pages)

TABLE 1
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA
1999 THROUGH 2005
DUTCH BOY/NATIONAL LEAD SITE

Sampling Date	Consultant and Source	Sample ID	Depth	Total Lead mg/kg	TCLP Lead mg/L	Discussion
July 13, 1999	Tetra Tech CSI 1/7/02	SB-1	0-2	2.66	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB-1A	2	202	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB-1A	2 5	**10800**	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB 1	5-7	23 1	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB-1A	3	31 1	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB-1A	3 5	10 1	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB-1A	4	8 75	NA	Remediated by Tetra Tech in 2001, exceedance no longer exists
		SB 2	1-3	49 9	NA	Concrete surface at grade, concrete currently present
		SB-2	5-7	6 72	NA	Concrete surface at grade, concrete currently present
		SB 3	1-3	39 2	NA	Concrete surface at grade, concrete currently present
		SB-3	5-7	19	NA	Concrete surface at grade, concrete currently present
		SB-4	1-3	751	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-4	5-7	140	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB 5	1-3	56 7	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-5	5-7	6 71	NA	ESC 1999 remediation area, soil from sampling interval remains at site
July 27, 2000	Earth Tech Phase III Report 3/15/01	Mud		[redacted]	2 12	Near former stack (material removed and disposed of off-site).
		Yellow Sand		162	0 521	Concrete surface above-grade, former mill building, (concrete removed by Earth Tech in 2000/2001), material deposited in corridor to west
		Foundry Sand		38 3	0 416	At grade slab remains, foundry sand deposited to basement area east
May 21, 2001	Tetra Tech CSI 1/7/02	SB-6	0-3	17 8 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-6	3-5	6	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB 7	0-3	18 4	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-7/7D	3-9	17.3/18.7	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-8	0-3	4 3	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-8	3-7	8 2	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-9/9D	0-3	11 5 J/21 7 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-9	3-7	20 3 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-10				No soil boring
		SB-11	0-3	291	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-11	3-6	36	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-12	0-3	13.1 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-12	4-9	7.8 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-13				No soil boring
		SB-14	0-3	[redacted]	NA	Concrete surface at grade (concrete removed by Earth Tech in 2000/2001) Unclear if concrete pad remains.
		SB-15	0-3	[redacted]	[redacted]	ESC 1999 remediation area, soil from sampling interval remains at site. Unclear if concrete pad remains.
		SB-15A	3-5	[redacted]	NA	ESC 1999 remediation area, soil from sampling interval remains at site.
		SB-16	0-3	67	NA	Concrete surface above-grade, former mill building, (concrete removed by Earth Tech in 2000/2001). No concrete remains.
		SB-16	3-7	16.4	NA	Concrete surface above-grade, former mill building, (concrete removed by Earth Tech in 2000/2001)
		SB-17	0-3	35 7 J	NA	Concrete surface at grade, concrete pad remains
		SB 17	3-6	35.5 J	NA	Concrete surface at grade, concrete pad remains.
		SB-18				No soil boring
		SB 19	0-3	15 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-19	3 6	60 J	NA	ESC 1999 remediation area, soil from sampling interval remains at site
		SB-20	0-3	[redacted]	NA	Concrete surface at grade, adjacent to former AST area (concrete at grade removed by Earth Tech in 2000/2001) Basement slab remains
		SB-20	3-5 5	111 J	NA	Concrete surface at grade, adjacent to former AST area (concrete at grade removed by Earth Tech in 2000/2001). Basement slab remains
		SB 21	0-3	124 J	NA	Concrete surface above-grade, former dock, (above-grade concrete removed by Earth Tech in 2000/2001, at grade pad remains)
		SB-21/21D	3-8	35 2/230	NA	Concrete surface above-grade, former dock, (above-grade concrete removed by Earth Tech in 2000/2001, at grade pad remains)
		SB-22	0-3	138	NA	Concrete surface at grade, former dock area (concrete at grade removed by Earth Tech in 2000/2001) Basement slab remains
		SB-22	3-6	7 1	NA	Concrete surface at grade, former dock area (concrete at grade removed by Earth Tech in 2000/2001) Basement slab remains
		SB 23	0-3	[redacted]	[redacted]	Concrete surface above-grade, former UST basement (above-grade concrete removed by Earth Tech in 2000/2001) Basement remains
		SB-23	3-7 5	10 8	NA	Concrete surface above-grade, former UST basement (above-grade concrete removed by Earth Tech in 2000/2001) Basement remains
		SB-24	0-3	12 8 J	NA	Concrete surface above-grade, (above-grade concrete removed by Earth Tech in 2000/20001) Slab at grade remains
		SB-24	3-6	16 6 J	NA	Concrete surface above-grade, (above-grade concrete removed by Earth Tech in 2000/20001) Slab at grade remains
		SB-25	0-3	49 J	NA	Concrete surface at grade, former AST area (concrete removed by Earth Tech in 2000/2001) (SW slab area) No concrete remains
		SB 25	3-6	1370 J	NA	Concrete surface at grade, former AST area (concrete removed by Earth Tech in 2000/2001) (SW slab area) No concrete remains
		SB-26	0-3	[redacted]	[redacted]	Concrete surface at grade, adjacent to former AST area (concrete removed by Earth Tech in 2000/2001) Unclear if concrete remains
		SB 26	3-6	56 7 J	NA	Concrete surface at grade, adjacent to former AST area (concrete removed by Earth Tech in 2000/2001) Unclear if concrete remains
		SB-27	0-3	78 6 J	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 No concrete remains
		SB-27	3-5 5	6 J	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 No concrete remains
		SB-28	0-3	83 3	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 No concrete remains
		SB-28	3-6	26 4	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 No concrete remains
		SB-29	0-3	520 J	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 Basement slab remains
		SB-29/29 D	3-6	202 J/ 152 J	NA	Concrete surface above-grade, former dock, concrete removed by Earth Tech in 2000/2001 Basement slab remains
		SB-30	0-3	[redacted]	[redacted]	Concrete surface above-grade, loading dock, concrete remains
		SB-30	3-6	383 J	NA	Concrete surface above-grade, loading dock, concrete remains
		SB-31	0-3	33 J	NA	Concrete surface above-grade, loading dock, concrete remains
		SB-31	3-8	25 1 J	NA	Concrete surface above-grade, loading dock, concrete remains
		SB-32	0-3	597	NA	Concrete surface above-grade, loading dock, concrete remains
		SB-32	3-7	21 1	NA	Concrete surface above-grade, loading dock, concrete remains